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as showing the approach of fine weather; but when this rise was accompanied by northerly and easterly winds, and when the air at the surface of the earth was becoming mingled with cooler particles descending from above, it is manifest that the increased pressure was due to the increase of density of the entire aerial column over the barometer resulting from these influences. Thus the change from a high to a low density of the air was necessarily accompanied by convection between the warmer and cooler strata, as exhibited by the anemoscope.

Before, as well as during north-easterly storms, we may thus expect precipitation of cold air downwards, and ascent of warm air upwards. During a gale it becomes difficult to distinguish these phenomena from the merely oscillatory movements impressed upon the lower strata of the atmosphere by the influence of terrestrial impediments. When a shallow current of water passes over a rough bottom, it assumes a ridged surface. If we superimpose additional water, the surface of the current will become gradually smooth, and it may ultimately present no sensible inequality, as on the surface of a deep stream; but we cannot conclude that the oscillatory action of the particles near the bottom has been entirely extinguished. The influence of the obstacles upon the motion of the current will decrease in approaching the surface, and increase in approaching the bottom.

Thus horizontal currents of air, close to the earth's surface, are necessarily disturbed by the presence of trees, buildings, and other obstacles, and in this manner they may influence the movements of a vertical vane precisely in the way that has been observed. During a storm an observed diminution of vertical oscillations of the vane will result from diminished violence of the wind, just as the gradual lessening of the movements of the water-barometer seemed to Professor Daniell to foreshadow the cessation of a gale. During comparatively calm weather, very energetic vertical movements of the atmosphere may be safely grouped among the most certain symptoms of approaching disturbances on a grander scale.

Professor Hennessy read a paper "On Anonymous Publications."

The REV. SAMUEL HAUGHTON, F. R. S., Fellow of Trinity College, Dublin, read a paper—

ON THE TIME OF HIGH WATER IN DUBLIN BAY, ON GOOD FRIDAY, THE 23RD APRIL, 1014, THE DAY OF THE BATTLE OF CLONTARF.

SOME time ago I was asked by the Rev. Dr. Todd to calculate for him the time of occurrence of high water, on the 23rd April, 1014, the day of the battle of Clontarf; as he believed that such calculation would throw important light on the accounts that exist of that famous battle.

The following is a brief account of the calculation and of its result. This result confirms in a remarkable manner the ancient account of the battle, with which I was unacquainted previous to making known to Dr. Todd the solution I had arrived at. I believe that, in consequence of the exact information obtained by the Academy in 1851 of the Irish

tides, that I am able to guarantee the result of my calculation of the time of high water, within a few minutes:—

From twelve o'clock, noon, of the 23rd April, 1014, to noon of the 12th December, 1860, allowing for the change of style and leap years, there were 309,223 real days.

The synodical period of the moon is 29.530588715 days, and new moon occurred on the 12th December, 1860, at 47.6 minutes after noon. Multiplying the length of the synodical month by 10472 months, we find

$$29.530588715 \times 10472 = 309244.325 \text{ days.}$$

From which, subtracting the number of days from 23rd April, 1014, to 12th December, 1860, or 309223 days, we find

$$21.325 \text{ days, or } 21^{\text{d}} 7^{\text{h}} 48^{\text{m}}$$

It follows from this calculation that new moon occurred at

$$\begin{array}{r} \text{April, . . .} \quad 23^{\text{d}} \quad 0^{\text{h}} \quad 47.6^{\text{m}} \text{—1014, A. D.} \\ \text{Minus . . .} \quad 21^{\text{d}} \quad 7^{\text{h}} \quad 48^{\text{m}} \\ \hline \end{array}$$

Or, at . . . $1^{\text{d}} 16^{\text{h}} 59.6^{\text{m}}$ —April, 1014, A. D.
i. e., at 5 o'clock on the morning of the second of April.

Therefore full moon occurred at

$$\begin{array}{r} \text{April, . . .} \quad 1^{\text{d}} \quad 16^{\text{h}} \quad 59.6^{\text{m}} \\ \text{Plus . . .} \quad 14 \quad 18 \quad 21.6 \\ \hline 16^{\text{d}} \quad 11^{\text{h}} \quad 21^{\text{m}}.2 \end{array}$$

Therefore the astronomical, or true full moon, occurred at 21 minutes past eleven at night of the 16th April, 1014.

Calculating by the established rules, the calendar or ecclesiastical full moon occurred on the 18th April, 1014 (Sunday), which would therefore make Easter Day fall on the 25th April, and make the 23rd April Good Friday, agreeable to the traditions of the battle of Clontarf.

I shall now show that the calculation of the tides makes it quite certain that the date 1014 falls in with all the physical circumstances related of the battle.

It appears from the calculation that I have given already that

The age of the moon at noon on the 23rd April, 1014, was 21.292 days, or $21^{\text{d}} 7^{\text{h}}$ nearly.

The tide was therefore a neap tide, and the moon in her third quarter.

From the Academy's observations, it appears that on such a day of the moon's age, at the spring equinox, the tide at Kingstown is full at $5^{\text{h}} 22^{\text{m}}$ in the morning,

from which it follows that the tide along the Clontarf shore, when not

obstructed by embankments and walls, could not have differed many minutes on the 23rd April, 1014, from

$5^h 30^m$ A. M.;

the evening tide being full in at

$5^h 55^m$ P. M.

In the following narrative, the full tide in the morning is said to have coincided with the sunrise: and as the sun rises from $5^h 30^m$ to $4^h 30^m$ in the month of April, the truthfulness of the narrative becomes strikingly evident. The extract is taken from the "Wars of the Gaedhil with the Gaill," or, "The Wars of the Irish with the Danes and other Foreigners," a work which Dr. Todd is editing in the original Irish, with a translation and notes, and which will form one of the series of Historical Chronicles of Great Britain and Ireland, now in course of publication under the authority of the Government. The following narrative occurs in ch. cvii. of this work:—

CVII.—"However, now, they continued in battle array and fighting from sunrise to evening. This is the same length of time as that which the tide takes to come, and to flood and to ebb. For it was at the full tide the foreigners came out to fight the battle in the morning, and the tide had come to the same place again at the close of the day, when the foreigners were defeated; and the tide had carried away their ships from them, so that they had not at the last any place to fly to, but into the sea, after all the mail-coated foreigners had been killed by the Dal Cais. An awful rout was now made of the foreigners and of the Laighin (Leinstermen), closely and simultaneously, and they shouted their respective cries, and whoops of rout, and retreat, and running; but they could only fly to the sea, because they had no other place to retreat to, seeing they were cut off between it and the head of Dubhghall's Bridge; and they were cut off between it and the wood on the other side. They retreated therefore to the sea, like a herd of cows in heat, from sun, and from gadflies, and from insects; and they were pursued closely, rapidly, and lightly; and the foreigners were drowned in great numbers in the sea, and they lay in heaps and in hundreds, confounded, after parting with their bodily senses and understanding, under the powerful, stout, stern mauling, and under the tremendous, hard-hearted pressure with which the Dal Cais, and the Connachtmen, and as many as were also there of the nobles of Erinn, pursued them."

I shall leave to Dr. Todd and others, well informed of the circumstances and localities of the battle of Clontarf, to draw further conclusions from the calculation I have presented to the Academy. To my mind it appears to throw considerable light on the foregoing narrative, and to establish conclusively that portions of it, at least, must have been written from the testimony of actual eye-witnesses, as none others could have invented the fact that the battle began at sunrise, and that the tide was then full in. The importance of the time of tide became

evident at the close of the battle, at 6 p.m., when the returned tide prevented the escape of the Danes from the Clontarf shore to the north bank of the Liffey.

Sir W. R. Hamilton and the Rev. Dr. Todd made some remarks on the foregoing paper.

MONDAY, MAY 27, 1861.

The **VERY REV. CHARLES GRAVES, D. D.**, President, in the Chair.

A LETTER was read from Major-General Sir Thomas R. Larcom, relative to the Treasury Minute concerning Treasure Trove in Ireland. Whereupon

IT WAS RESOLVED,—That the respectful thanks of the Royal Irish Academy are due, and are hereby presented, to the Lords of her Majesty's Treasury for the liberal manner in which they have provided for the preservation of articles of Treasure Trove, and for the favour they have done the Academy in making it the depository of such objects.

IT WAS ALSO RESOLVED,—That the Royal Irish Academy, in acknowledgment of his Excellency the Lord Lieutenant's gracious interference on its behalf, in reference to the articles of Treasure Trove in Ireland, is bound, and takes the present early opportunity to tender its grateful acknowledgments of the same; and begs to assure his Excellency that it will deem it a privilege to render its best assistance and co-operation in furthering a measure so likely to conduce to the advancement of antiquarian studies and the extension of the National Museum.

IT WAS ALSO RESOLVED,—That the President be requested to communicate to Major-General Sir Thomas A. Larcom the Academy's sense of the value of his services in regard to the arrangements lately made concerning Treasure Trove in Ireland, which are so likely to conduce to the furtherance of antiquarian studies, and the advantage of an Institution in whose welfare he has always taken such a lively interest.

The **REV. DR. TODD, V. P.**, read the following paper:—

SOME REMARKS ON THE HISTORY OF THE BATTLE OF CLONTARF, IN CONNEXION WITH MR. HAUGHTON'S DETERMINATION OF THE TIME OF HIGH WATER IN DUBLIN BAY ON GOOD FRIDAY, APRIL 23, 1014.

HAVING met with a statement in an ancient authority, to which Mr. Haughton has already called the attention of the Academy, that on the day of the battle of Clontarf, the time of high water coincided with the hour of sunrise in Dublin Bay, it occurred to me that this circumstance afforded a means of testing the accuracy of the narrative. I knew that Mr. Haughton had undertaken, and in part executed, the arduous task of reducing the tidal observations collected some years ago under the auspices of the Academy, and that he had also, for a reason which he will himself have an opportunity of explaining to you this evening, paid